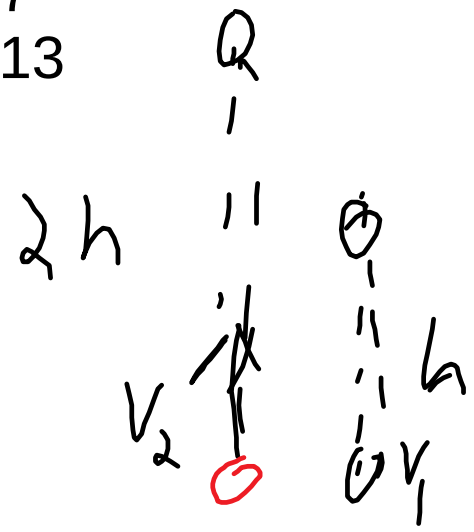
p237
AC 13



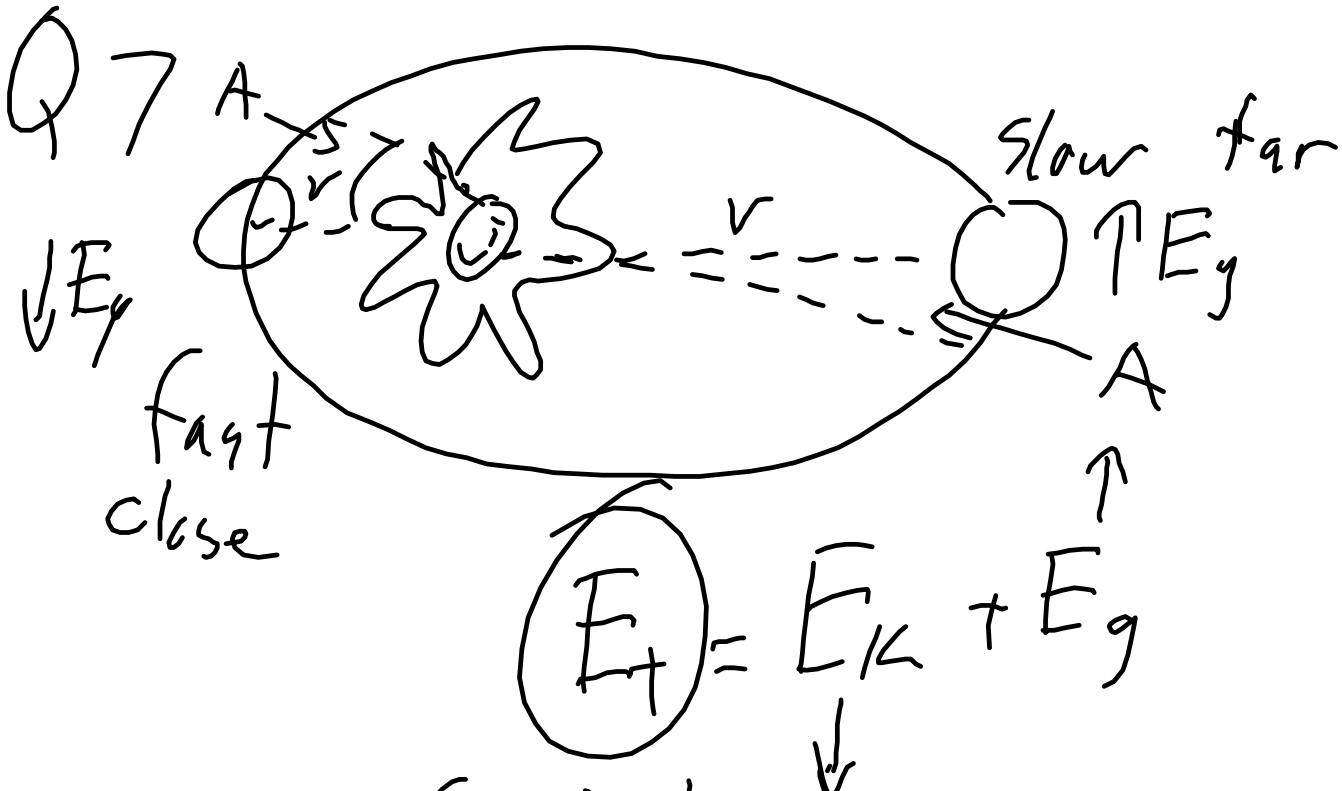
$$mgh = \frac{1}{2}mv_1^2$$

$$v_1 = \sqrt{2gh}$$

$$v_2 = \sqrt{2g2h}$$

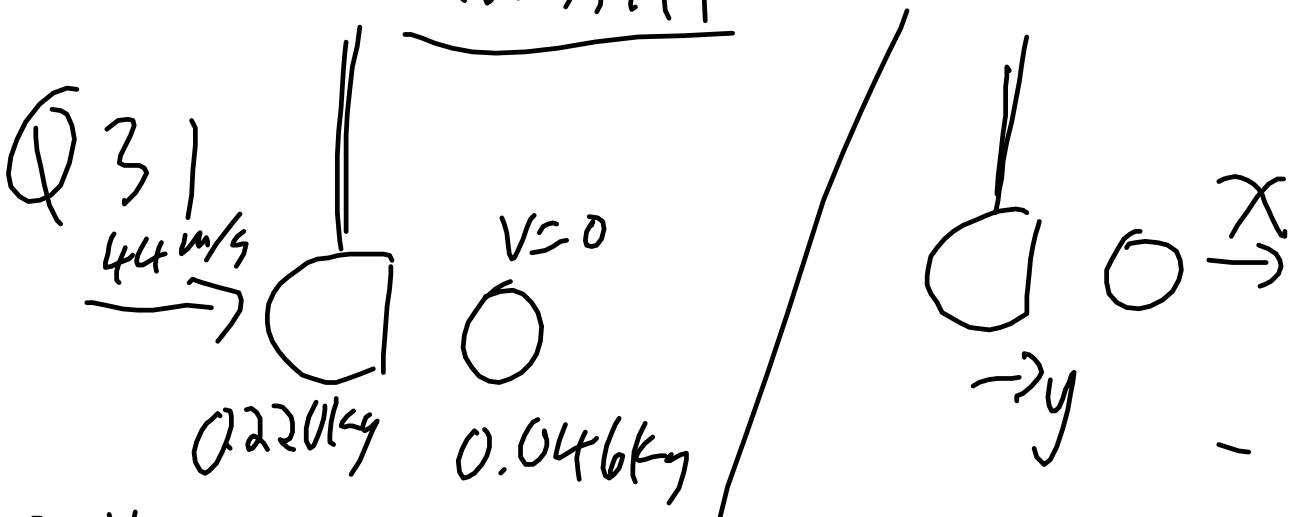
$$v_2 = \sqrt{2}\sqrt{2gh}$$

$$v_2 = \sqrt{2}\,v_1$$



Constant

Q31



All collisions + explosions

Momentum $\Sigma P_i = \Sigma P_f$

$$m_c v_c + 0 = m_c y + m_B x$$

$$0.22 \times 44 = 0.22y + 0.046x$$

$$y = 44 - \frac{0.046x}{0.22}$$

elastic Spiral

Ek conserved $\frac{1}{2} m_c v_c^2 = \frac{1}{2} m_c y^2 + \frac{1}{2} m_B x^2$

$$44^2 = y^2 + \frac{0.046}{0.22} x^2$$

0.046/0.22=0.2091

$44^2=1{,}936 = (44-0.2091x)^2 + 0.2091x^2$
$44 \times 0.2091=9.2004$ $9.2004 \times 2=18.4008$
$0.2091 \times 0.2091=0.0437$
$1936 =1936 -18.4008x +0.\mathbf{0437x^2} + 0.2091x^2$

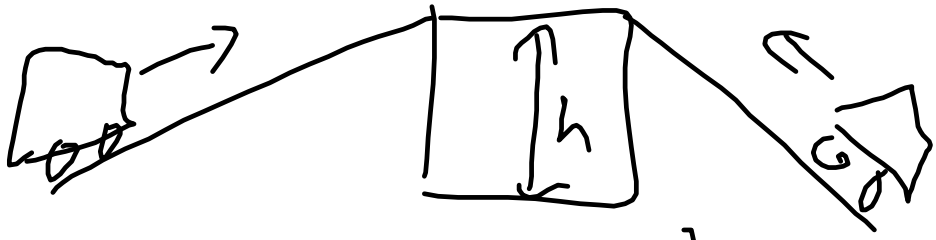
$0 = -18.4008x +0.0437x^2 + 0.2091x^2$
$0.2091+0.0437=0.2528$
$0 = -18.4008x\ 0.2428x^2$
$x = 18.4008/0.2528=72.788$

$y = 44-(0.2091 \times (72.788))=28.78$

club moves at 28.8 m/s and the ball moves at 72.8m/s

p212
AC3

2.0m high platform
3.0m ramp
4.0m ramp



$\Delta Energy = W = mgh$
$E_K = 0$

if there is no energy lost to frictional forces, the

work done is path independent = mgh using either ramp.

what if there is friction of 2.0N? then the shorter ramp would require less work.

the ramp doesn't make less work, it makes easier work - less force in this case.

Problem 4 p213

W = change in energy or Fxd
W = mgh
density = mass /volume
so mass = density x volume
m = 2000x1.15=2300.0 kg
Fg = 2300x9.8=22540 N
F total = 22540+2250=24790 N

W=Fxd = 24790x7.5=185925 J

$W = 1.86 \times 10^5 J$ or 186kJ

15 minutes:
 work on p212-214 AC 1-7, Prob1,4,5,16,20
p237-239 AC1,3,5,7,13 Prob 3,8,22,29,31

if you are done, study by doing all the other

problems

p213
AC 7
How do you increase the IMA, ideal mechanical advantage?

IMA = din/ dout

increase the din - the distance the input force acts
examples:
use a pulley with more ropes -
use a wrench and push on the outside
use a longer ramp
lower gear on your bike

p237
Problem 3c

a) Ek = 0.5x45x10^2=2,250 J
b) 0.5x45x5^2=562.5 J
c) Eka/Ekb 2250/562.5=4 times the kinetic energy with double the speed

kinetic energy is proportional to the velocity **squared**

p237 AC 13

pop ups in baseball, the second goes twice as high, how do their speeds compare?

$mgh = 1/2mv^2$
$gh = 1/2v^2$
$v^2 = 2gh$
$v_1 = \sqrt{(2gh)}$
$v_2 = \sqrt{(2g2h)} = \sqrt{2}x\sqrt{(2gh)} = \sqrt{2}xv_1$
$v_2 = \sqrt{2}xv_1$
so the second popup is faster by a factor of the square root of 2 to get twice as high.

p238 Q8

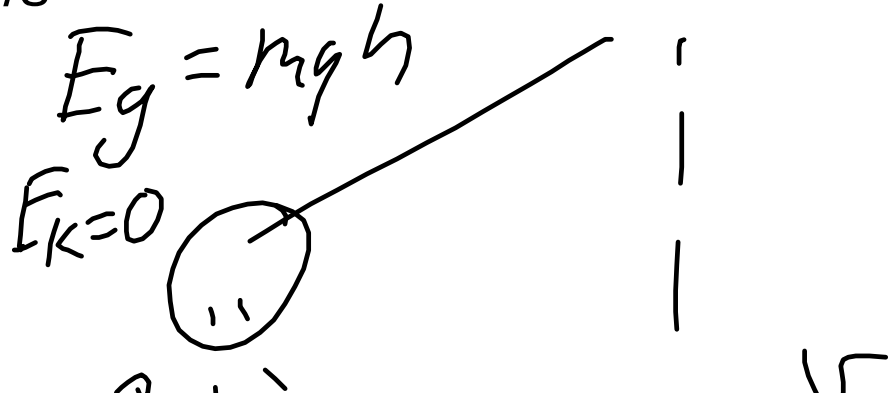
$W = Fxd = 5.00x10^5Nx500m = 2.5x10^8J$

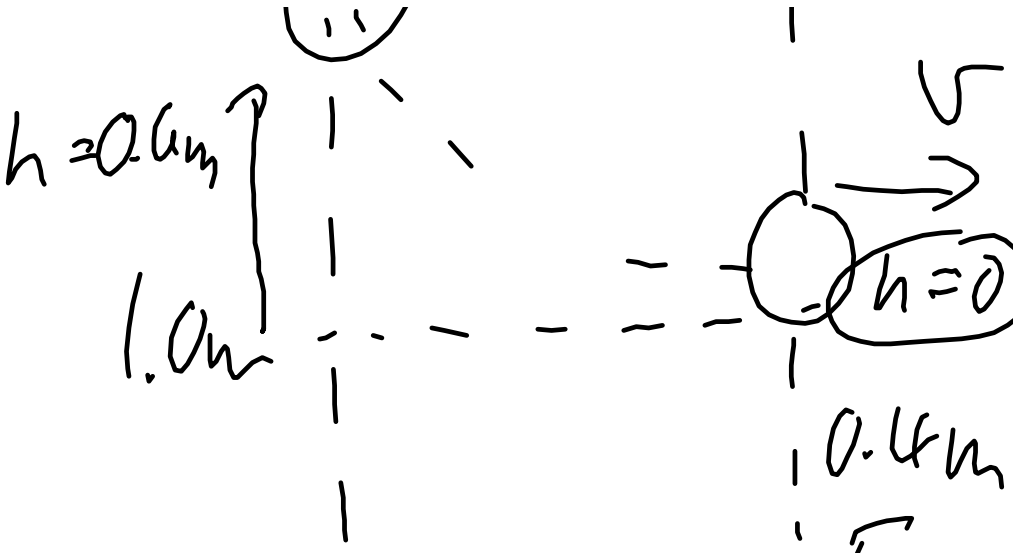
b) change in kinetic energy = Work done
$= 2.5x10^8J$

c) $2.5x10^8J$

d) $1/2mv^2$ = Energy
v= Sqrt(2x2.5E8/2.5E4)=141.4213562373095
141m/s

p239
Q24





$E_K = \frac{1}{2}mv^2$

$mgh = \frac{1}{2}mv^2$ $\quad v = \sqrt{2gh}$

$v = \sqrt{2 \times 9.8 \times 0.6}$

$v = 3.4 m/s$

b) $E_K = \frac{1}{2}mv^2$

$\frac{1}{2}\left(\frac{420}{9.8}\right)(2)^2 = 85.7 J$

$m = \frac{F_g}{g}$

$mgh = 420 \times 0.6 = 252 J$

$-166 J$ Emg

15 minutes:
work on p212-214 AC 1-7, Prob1,4,5,16,20
p237-239 AC1,3,5,7,13 Prob 3,8,22,29,31

if you are done, study by doing all the other problems

Q15 p235

superman hit by a bullet with a perfectly elastic collision - how do you determine the velocity of the bullet and superman after the collision.

collision or explosion - momentum is conserved

perfectly elastic collision - momentum and kinetic energy are conserved

2 equations with 2 unknowns and you sub in

$m_1v_1+m_2v_2=m_1x+m_2y$

$1/2\ m_1v_1^2+1/2m_2v_2^2=1/2m_1x^2+m_2y^2$

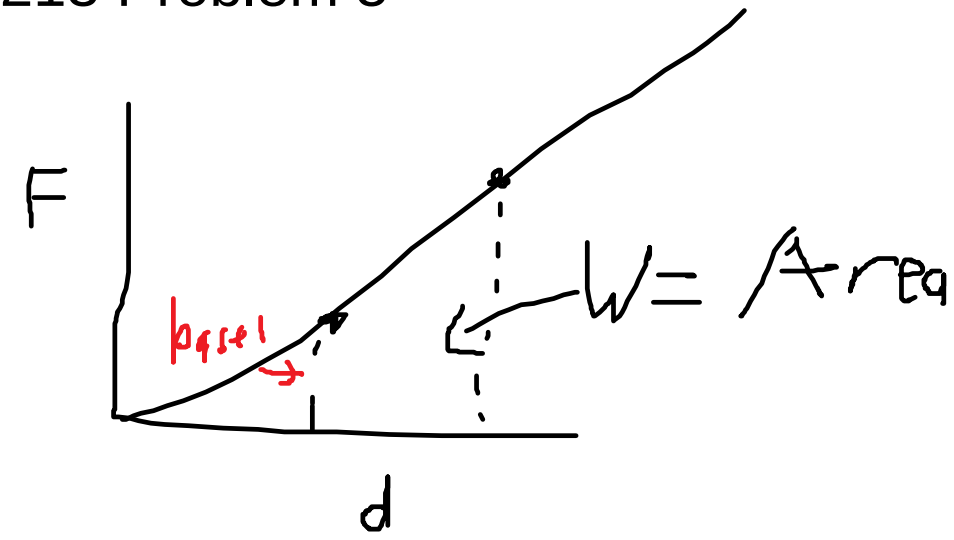
$0.0042x835+0=0.0042x+104y$
$x= 835-(104/0.0042)y$
$104/0.0042=24,761.9048$

104/0.0042=24,761.9048

1/2 0.0042x835^2+0=1/2 0.0042x^2+1/2 104y^2
$835^2 = x^2 + 24761.9y^2$
$835^2 = (835-24761.9y)^2 + 24761.9y^2$
835x24761.9=2.0676E7 2.0676E7x2=
41,352,000 24761.9^2=6.1315E8
$835^2 = 835^2 - 41352000y + 6.1315x10^8y^2 + 24761.9y^2$

6.1315E8+24761.9=6.1317E8
$0 = - 41352000y + 6.1315x10^8y^2 + 24761.9y^2$
y = 41352000/6.1317E8=0.0674 m/s

p213 Problem 5



Area = 1/2 (base1 + base2)h
W = 0.5x(3+7)x(0.28-0.12)=0.80J
area under a F-d graph is work = change in energy

p238
Problem 8

mass = 2.50×10^4kg
F = 5.00×10^5N
d = 500m

a) W = Fd = 500000x500=250000000
2.50×10^8J
b) ΔEk = W = 2.50×10^8J
c) if Eki = 0, the Ekf = 2.50×10^8J
d) $1/2mv^2$ = Ek
v= $\sqrt{}$(2Ek/m) = Sqrt(2x2.5E8/2.5E4)=
141.4213562373095
141 m/s